Integrated Fluorimeter Development

Molecular Biology → ***Information Technology***

BIO **INFO**

Fluorescence Measurement

MICRO

Sequencers

Microarray Readers

Biochemical Assays

Cytometers

Imaging

Etc.

James Harris

Ofer Levi

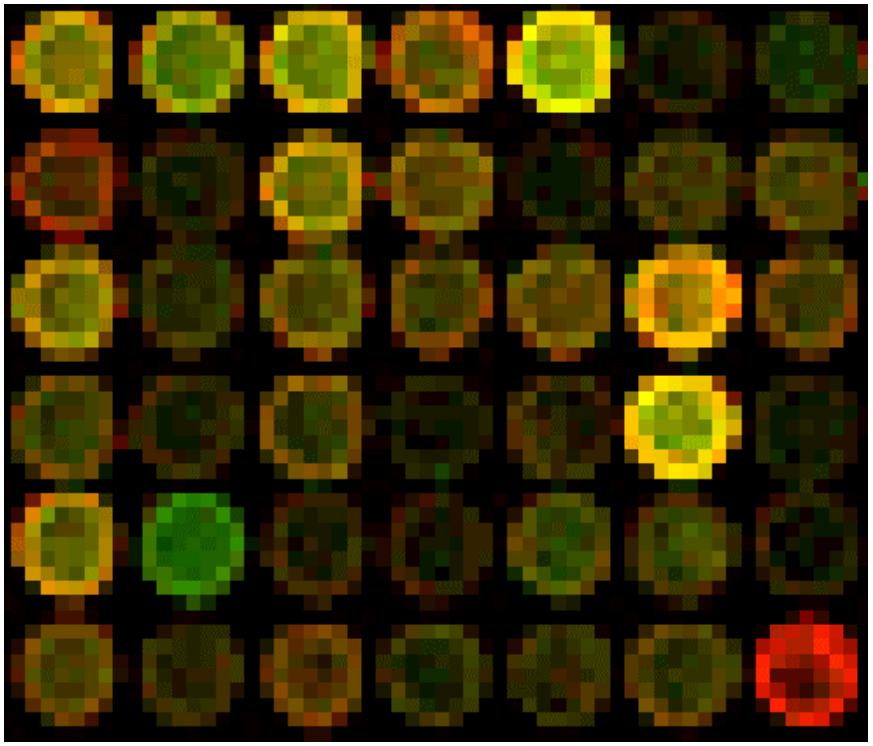
Evan Thrush

Electrical Engineering

Stephen Smith

Molecular and Cellular Physiology

Layout of Typical cDNA Microarray (Y2K)



-Feature Size: 150 um

-Dictated by “Noise” Sources

-Pitch Size: 200 um

-Cross Talk Reduction

-Two Color

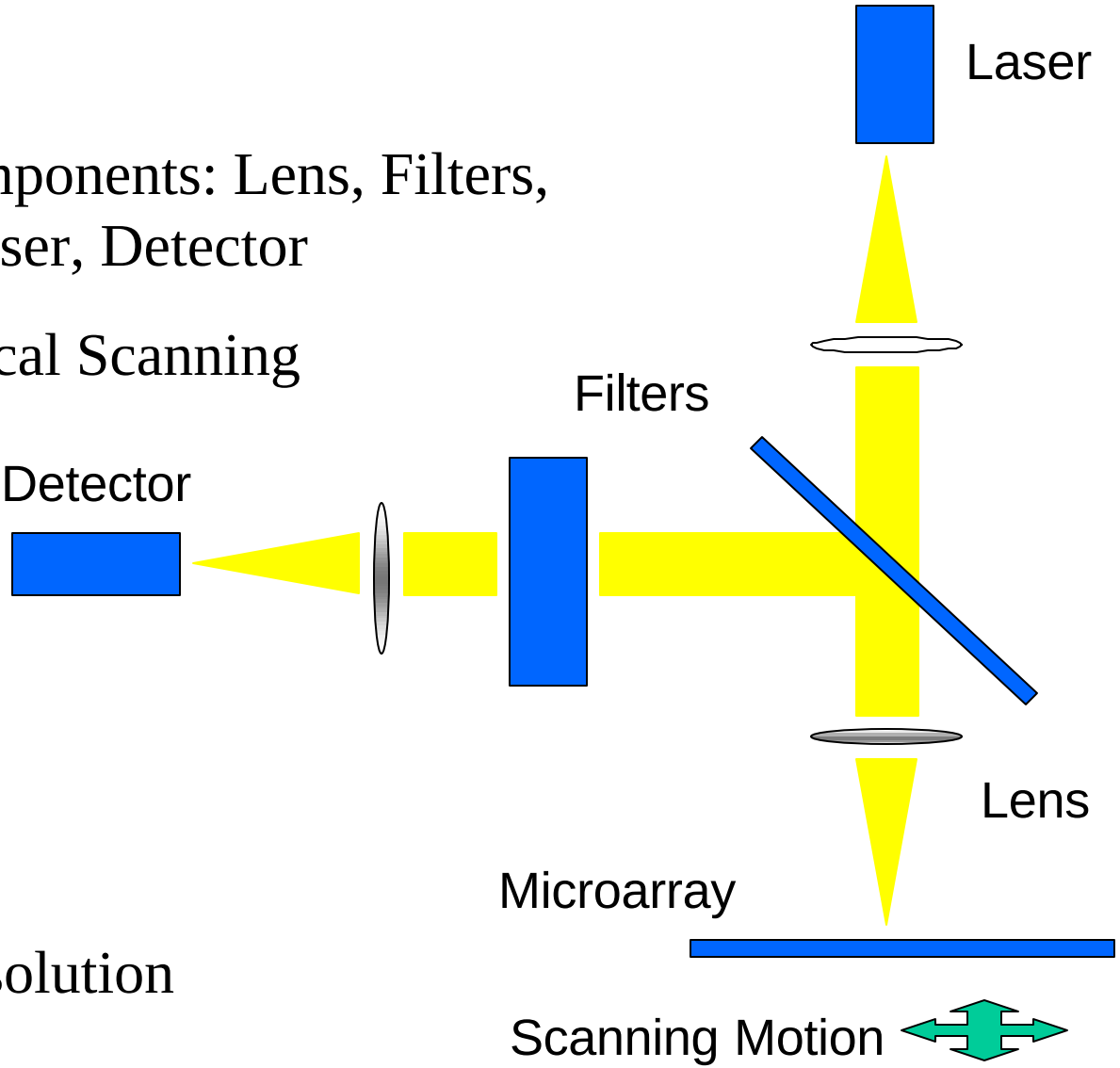
-Normalization

Conventional DNA MICROARRAY READERS

-Disadvantages

-Bulk Components: Lens, Filters, Mirror, Laser, Detector

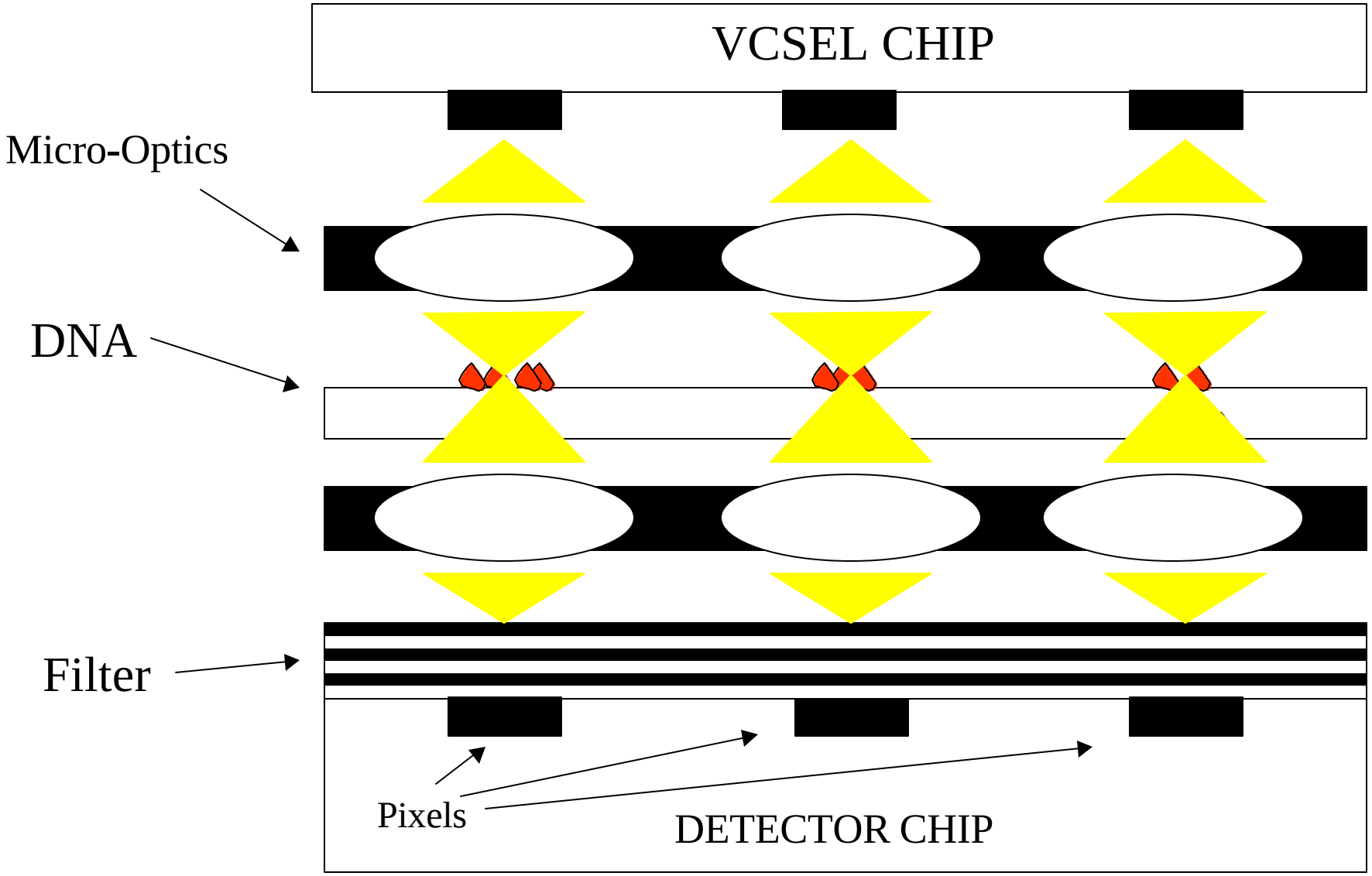
-Mechanical Scanning System



-Advantages

-Good Resolution

INTEGRATED DESIGN



ADVANTAGES OF INTEGRATED DESIGN

-Portable

-Lightweight

-Compact

-Mechanically Robust

-Eventual Low Cost

- Opens new application areas: e.g., Integrate with “Lab on Chip” for Battery-Powered, Wireless “Doctor in a Box”

-Throughput Scaling

-Low Power

-No Mechanical Scanning System

Disadvantages of Integrated Solution

-Lower Resolution

-Micro-Optics are less efficient

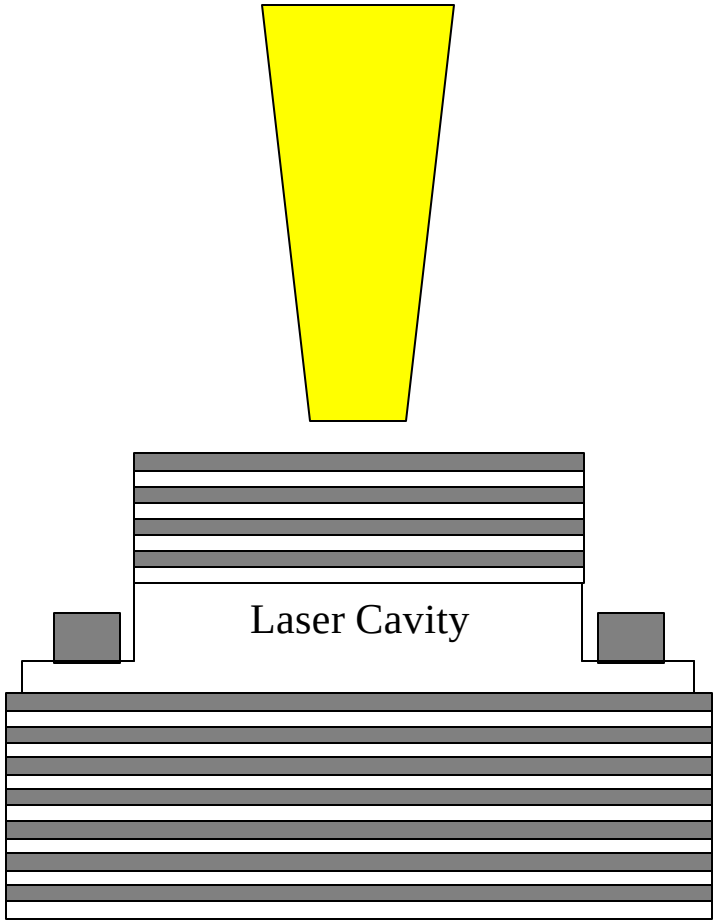
-Spot Illumination

-Requires Precise DNA Microarray Manufacture

-Transmission Detection

-Requires Excellent Emissions Filter

Design of VCSEL



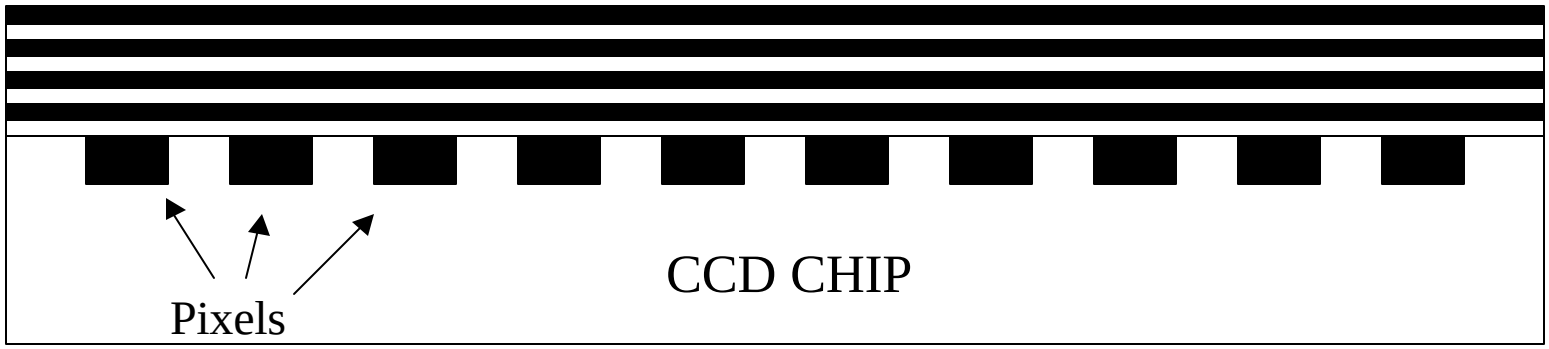
-Laser Wavelength: 780nm

-Use with LiCor DNA Dyes

-2D Array at 100um Pitch

- 1-10mW of Output

Design of Detector Chip



-Use CCD Detector Array

-Deposit Optical Filter on Planarized Detector Chip

Another Interesting Design: "Microscope on a Chip"